MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
(Autonomous)
B.Tech. III Semester End Examinations
(Model Question Paper)

MR-21

Course Title: Probability Distributions and Numerical Methods **Course Code: MA303BS**
Time: 3 hours Max. Marks: 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What is the probability that a card drawn at random from the pack of playing cards may be either a queen or a king	2	1	1	1
1. b)	Calculate expectation of X, if the probability distribution of the random variable X is given by x: -1, 0, 1, 2, 3 f: 0.3, 0.1, 0.1, 0.3, 0.2	2	3	1	2
	Unit-II				
1. c)	Solve for the values of n & p of the binomial distribution for which the mean is 4 and variance is 3	2	3	2	1
1.d)	If a random variable has a poisson distribution such that P(x=1) = P(x=2) find the Mean of the Poisson distribution.	2	1	2	2
	Unit-III				
1. e)	Explain type I error	2	5	3	2
1.f)	write the test statistic for large sample single mean	2	1	3	2
	Unit-IV				
1. g)	Mention the first approximation of one of the roots $f(x) = 0$ by regula falsi method under the conditions that f(a) & f(b) have opposite signs and a < b	2	1	4	1
1.h)	what is the condition for the convergence of successive approximation method	2	1	4	
	Unit-V				
1. i)	f (x) is given by x: 0, 0.5, 1 f(x): 1, 0.8, 0.5 Then use Trapizoidal rule to calculate $\int_0^1 f(x)dx$	2	3	5	1
1.j)	What is the Simpsons 3/8 rule to evaluate $\int_a^b f(x)dx$	2	1	5	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2.a)	Of the 3 men the chances that a politician a businessman or an academician will be appointed as a vice chancellor of a university are 0.5, 0.3 , 0.2 respectively. Probability that research is promoted by these persons if they are appointed as vice chancellor are 0.3, 0.7, 0.8 respectively. If research is promoted, what is the probability that VC is an academician.	5	1	1	2
2.b)	Two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that i) target is hit ii) both fail to score hit	5	1	1	2
	OR				
2. c)	A player wins if he gets 5 on a single throw of a die, he loses if he gets 2 or 4. If he wins, he gets ₹50, if he loses he gets ₹10, otherwise he has to pay ₹15. Find the value of the game to the player. Is the game favourable to the player?	5	1	1	2
2.d)	If a random variable has the probability density function $f(x)$ = k $(x^2 - 1)$, -1≤ x ≤ 3. = 0 elsewhere	5	1	1	2

<table>
<tr><td></td><td>Find the value of k and p(1/2 ≤ x ≤ 5/2)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. a)</td><td>It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least 1/3. Accordingly, what are the probabilities that the utility bill will be reduced by at least 1/3 in
i) four of five installations.
ii) at least four of five installations.</td><td>5</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>3. b)</td><td>It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 search tools
a) 3% or more will be defective
b) 2% or less will be defective</td><td>5</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>3. c)</td><td>The marks obtained in mathematics by 1000 students are normally distributed with men 78% and standard deviation 11%. Find
i) how many students got marks above 90%
ii) what was the highest mark obtained by the lowest 10% of the students.
iii) Within what limits did the middle 90% of the students lie.</td><td>5</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>3.d)</td><td>Suppose 10% of the probability for a normal distribution N(μ,σ^2) is below 35 and 5% above 90. Solve for the values of μ and σ.</td><td>5</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>4. a)</td><td>An oceanographer wants to check whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the 0.05 level of significance, if readings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms.</td><td>5</td><td>1</td><td>3</td><td>2</td></tr>
<tr><td>4. b)</td><td>The average marks scored by 32 boys is 72 with a standard deviation of 8. While that of 36 girls is 70 with a standard deviation of 6. Does this indicate that the boys perform better than girls at 0.05 level of significance.</td><td>5</td><td>2</td><td>3</td><td>2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>4. c)</td><td>A manufacturer claims that only 4% of his products are defective. A random sample of 500 were taken among which 100 were defective. Test the hypothesis at 0.05 level of significance.</td><td>5</td><td>4</td><td>3</td><td>2</td></tr>
<tr><td>4.d)</td><td>Random samples of 400 men and 200 women in a locality were asked whether they would like to have a bus stop near their residence. 200 men and 40 women were in favour of the proposal. Test the significance in the difference of opinion.</td><td>5</td><td>4</td><td>3</td><td>2</td></tr>
<tr><td>5. a)</td><td>Solve the $x^3 + 2x^2 + 0.4 = 0$ using Newton Raphson method.</td><td>5</td><td>3</td><td>4</td><td>1</td></tr>
<tr><td>5. b)</td><td>Using iteration method find a real root of f(x)=x^2-3x+1 correct up to 3 decimals starting with x=1.</td><td>5</td><td>1</td><td>4</td><td>2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>5. c)</td><td>Use gauss forward interpolation formula to find f(3.3) from the following table
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>Y=f(x)</td><td>15.30</td><td>15.10</td><td>15.00</td><td>14.50</td><td>14.00</td></tr>
</table></td><td>5</td><td>3</td><td>4</td><td>1</td></tr>
<tr><td>5.d)</td><td>Using Lagrange formula what is the value of f(3) from the following table
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>f(x)</td><td>1</td><td>14</td><td>15</td><td>5</td><td>6</td><td>19</td></tr>
</table></td><td>5</td><td>4</td><td>4</td><td>2</td></tr>
<tr><td>6. a)</td><td>Evaluate$\int_0^{\pi} t \sin t dt$ using the Trapizoidal rule.</td><td>5</td><td>5</td><td>5</td><td>1</td></tr>
<tr><td>6. b)</td><td>Evaluate$\int_0^1 \frac{1}{1+x}$dx using simpsons 1/3 rule</td><td>5</td><td>5</td><td>5</td><td>1</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>6. c)</td><td>Solve the differential equation $\frac{dy}{dx} = x^2 + y$, y(0)=1 by modified Euler's method and compute y(0.02) and y(0.04).</td><td>5</td><td>3</td><td>5</td><td>1</td></tr>
<tr><td>6.d)</td><td>Find y(0.1) and y(0.2) using Range-Kutta fourth order formula given that $\frac{dy}{dx} = x^2 - y$ and y(0)=1</td><td>5</td><td>1</td><td>5</td><td>2</td></tr>
</table>

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY
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B.Tech. III Semester End Examinations
(Model Question Paper)

MR-21

Course Title: Analog and Digital Electronics **Course Code: EC331ES**
Time: 3 hours Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What is meant by Zener Breakdown?	2	2	1	1
1. b)	What is diffusion capacitance?	2	1	1	1
	Unit-II				
1. c)	Write any two differences between CB and CE configurations?	2	1	2	1
1. d)	What is the need of transistor biasing?	2	2	2	1
	Unit-III				
1. e)	Write any two differences between BJT and JFET?	2	2	3	1
1. f)	Draw the diagram of CMOS NOT gate?	2	1	5	2
	Unit-IV				
1. g)	Write the logic of half adder with Boolean functions?	2	1	4	2
1. h)	Draw the 4x1 multiplexer?	2	1	4	1
	Unit-V				
1. i)	Define T Flip Flop with the help of characteristic equation?	2	1	4	1
1. j)	Differentiate Mealy Machine and Moore Machine?	2	2	4	2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain the operation of PN Junction Diode with the help of VI characteristics?	5	2	1	1
2. b)	Draw the diagram of bridge rectifier and derive the efficiency and ripple factor?	5	3	1	2
	OR				
2. c)	Explain the operation of Photo Diode with the help of VI characteristics?	5	2	1	1
2. d)	Compare half wave and full wave rectifiers?	5	3	1	2
	Unit-II				
3. a)	Draw CB configuration of transistor and explain its input and output characteristics?	5	1	2	1
3. b)	Calculate operating point for the fixed bias circuit?	5	3	2	2
	OR				
3. c)	Draw CE configuration of transistor and explain its input and output characteristics?	5	2	2	1
3. d)	Solve the expression for stability factor in voltage divider bias circuit?	5	3	2	2
	Unit-III				
4. a)	Explain the JFET operation with the help of diagrams?	5	2	1	1
4. b)	Draw CMOS NOR gate and explain with neat diagram.	5	3	5	2
	OR				
4. c)	Draw the Drain and Transfer characteristics of Depletion MOSFET and explain with neat diagrams?	5	2	1	1
4. d)	Realize XOR gate using NAND gates?	5	2	5	3

Unit-IV					
5. a)	Derive the logic expression for full adder with the help of truth table?	5	3	4	2
5. b)	Obtain minimal POS expression for the Boolean function. F(A,B,C,D)=Π(0,1,2,3,4,6,9,10)+d(7,11,13,15).draw the circuit using 2 input NAND gates	5	1	3	2
OR					
5. c)	Design 2 Bit Comparator and draw logic diagram?	5	3	4	3
5. d)	Explain the differences between canonical SoP and canonical PoS with suitable example	5	2	3	2
Unit-V					
6. a)	Draw the diagram of RS flip flop and explain the operation with truth table	4	2	4	2
6. b)	Design and develop Mod-10 Asynchronous counter using T- FlipFlop	6	6	4	3
OR					
6. c)	Design Mod 6 synchronous counter?	6	6	4	3
6. d)	Explain PISO shift register with the help of neat diagram	4	2	4	1

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MR-21

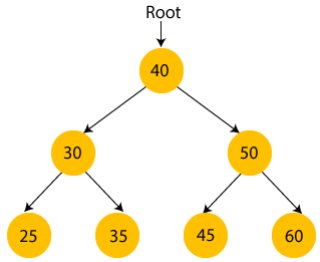
Course Title: Data Structures **Course Code: CS301PC**
Time: 3 hours Max. Marks: 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define a Data Structure. What are the different types of Data Structures?	2	1	1	1, 2
1. b)	Define ADT. Write the operations on data structures.	2	1	1	1, 2
	Unit-II				
1. c)	Differentiate between Single Linked list and Doubly Linked list	2	2	2	1, 2
1.d)	Write the node structure in a Circular Linked list	2	2	2	1, 2
	Unit-III				
1. e)	What is a Binary tree? Mention the tree traversals	2	1	3	1, 2
1.f)	Write the properties of Binary Search Tree.	2	2	3	1, 2
	Unit-IV				
1. g)	Define a Graph. What are different Graph traversals?	2	1	4	1, 2
1.h)	Differentiate between Linear Search and Binary Search.	2	2	4	1, 2
	Unit-V				
1. i)	Give example of Folding Hash method	2	2	5	1, 2
1.j)	What are the different collision resolution techniques?	2	1	5	1, 2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2.a)	Explain evaluation of postfix expression with an example	4	2	1	1, 2
2.b)	Write a C program for Queues using arrays.	6	3	1	3, 12
	OR				
2.c)	What is stack? What are the basic operations associated with stack?	5	1	1	1, 2
2.d)	Convert following arithmetic infix expression into postfix by using stack : A*(b + c) + (b/d) * a + z * u	5	2	1	3, 12
	Unit-II				
3.a)	Write the algorithm for insertion of a new node as last node in Doubly linked list.	4	2	2	3
3.b)	Implement insert() and delete() functions in Queues using Single linked list	6	3	2	3, 12
	OR				
3.c)	Implement push() and pop() functions in Stacks using Single linked list	6	3	2	3, 12
3.d)	Write the algorithm for insertion of a new node as middle node in Single linked list	4	2	2	3
	Unit-III				
4.a)	Construct a Binary Search tree using the elements 14,25,51,12,21,45,11,10	4	4	3	1, 2
4.b)	Construct a binary tree having the following traversal sequences: Preorder traversal: A B C D E F G H I Inorder traversal: B C A E D G H F I	6	4	3	1, 2
	OR				
4.c)	Define a Binary Tree. Explain the Binary tree representations with an example	5	1	3	1, 2

4.d)	Write a brief note on Traversing a binary tree. Find the preorder and postorder traversal of following tree.  	5	2	3	3
Unit-IV					
5.a)	Write Linear Search algorithm with an example	5	2	4	1, 2
5.b)	Distinguish between BFS and DFS	5	4	4	1, 2
OR					
5.c)	Define a Graph. Explain Adjacency matrix representation of a Graph with an example.	4	1	4	1, 2
5.d)	Sort the following list of elements using Insertion sort 15,28,46,10,35,54,5,17	6	3	4	3, 12
Unit-V					
6.a)	What is Hashing? Write about any hashing functions	5	1	5	1, 2
6.b)	What is collision? Explain linear probing with example	5	2	5	1, 2
OR					
6.c)	Write about Double Hashing and Rehashing with examples	5	1	5	1, 2
6.d)	What is collision? Explain Quadratic probing with example	5	2	5	1, 2

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MR-21

Course Title: Object Oriented Programming using C++ **Course Code: CS303PC**
Time: 3 hours Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What are the features of Object Oriented Programming	2	1	1	1
1. b)	Differentiate between structure and class in C++	3	2	1	1
	Unit-II				
1. c)	Discuss about 'this' pointer with an example	2	1	2	1
1. d)	Define a constructor and list of different types of constructors	3	1	2	1
	Unit-III				
1. e)	Define Inheritance	2	1	3	1
1. f)	Write a short on virtual destructor.	3	2	3	1,2
	Unit-IV				
1. g)	Draw the Stream Class Hierarchy	2	2	4	1,2
1. h)	List out different file position pointers	3	1	4	1,2,12
	Unit-V				
1. i)	List out the advantages of Exception handling	2	1	5	1,2,12
1. j)	What is Stack Unwinding in C++	3	2	5	1,2,12

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain about different paradigms for problem solving	5	2	1	1
2. b)	List out different String functions in C++. Write a C++ program to implement all the string functions.	5	2	1	1
	OR				
2. c)	Difference between Procedural Programming and Object-Oriented Programming	5	2	1	1
2. d)	Discuss about dynamic memory of allocation with an example program.	5	2	1	1
	Unit-II				
3. a)	Explain about different access specifiers in C++ with an example program	5	2	2	1,2
3. b)	Discuss about constructor Overloading in C++	5	2	2	1,2
	OR				
3. c)	What is the use of friend function in C++. Write a program to find greatest of three numbers using friend function	5	3	2	1,2
3. d)	Write a short notes on static variables and static members of a class	5	2	2	1,2
	Unit-III				
4. a)	Explain about different modes of Inheritance with an example programs	5	2	3	1,2,12
4. b)	Differentiate between Late binding and Early Binding	5	2	3	1,2,12
	OR				
4. c)	Discuss in detail about different types of Inheritance with an example programs.	5	2	3	1,2,12
4. d)	What is pure virtual function. Write a program to implement pure virtual function.	5	3	3	1,2
	Unit-IV				
5. a)	Write a C++ program to read and write data into a file.	5	3	4	1,2,12
5. b)	Explain about error handling functions with a program	5	2	4	1,2,12
	OR				
5. c)	Write a C++ program for Complex number subtraction using operator overloading	5	3	4	1,2,12
5. d)	Write a C++ program for Overloading Binary Operator using a Friend function	5	3	4	1,2
	Unit-V				
6. a)	Illustrate Rethrowing exceptions with an example	5	2	5	1,2,12
6. b)	Explain about Exception Specifications with an example program	5	2	5	1,2
	OR				
6. c)	Define a Template and explain about Function template with an example program	5	2	5	1,2,12
6. d)	Write a C++ program to implement Multiple catch blocks in a single try block.	5	2	5	1,2,12

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MR-21

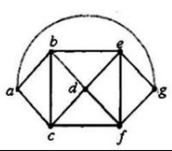
Course Title: Discrete Mathematics **Course Code: CS306PC**
Time: 3 hours Max. Marks : 70

Note: Answer ALL Questions
Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Explain different logical connectives in mathematical logic	2	2	1	1,2,3
1. b)	Verify the following formulas are well formed formulas are not? (i) P→(PVQ) (ii) (P→(~P)) →~P (iii) ((~Q ΛP) ΛQ)	2	3	1	1,2,3 ,4
	Unit-II				
1. c)	If A= {1,2,3}, B= {4,5} find i) AXB ii) BXA	2	3	2	1,2,3
1. d)	Prove that A-(B∩C) =(A-B) U(A-C)	2	3	2	1,3,4
	Unit-III				
1. e)	Differentiate between Mathematical Induction and Strong Induction	2	2	3	1,2,3
1. f)	Define Sum Rule and Product Rule.	2	1	3	1,3,4
	Unit-IV				
1. g)	Explain the principle of inclusion – exclusion?	2	2	4	1,2,3
1. h)	Solve the recurrence relation an= nan-1 for n≥1 where a0=1	2	3	4	1,3,4
	Unit-V				
1. i)	Define Spanning tree?	2	1	5	1,2,3
1. j)	Is K2,3 is a complete bipartite Graph?	2	2	5	1,3,4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Show that ~p follows from the set of premises (r→~q), rVs, s→~q, p→q using indirect method of proof	5	3	1	1,2,3
2. b)	Show that the following implication without constructing truth table (i) (p→q) →q ⇒(pVq) (ii) p→q ⇒ p → p Λq	5	3	1	1,2,3,4
	OR				
2. c)	a) Rephrase the statement formula $(P \to (Q \wedge R)) \wedge (\neg P \to (\neg Q \wedge \neg R))$ as principal conjunctive normal form. Also define PCNF and PDNF.	5	3	1	1,2,
2. d)	b) "If there was a ball game, then traveling was difficult. If they arrived on time, then traveling was not difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument.	5	2	1	1,2,3,4
	Unit-II				
3. a)	Find all the properties that satisfies for the following algebraic systems under the binary operations 'X' and '+'. (a) Odd integer (b) All positive integers	5	2	2	1,2,3
3. b)	Draw the Hasse diagram for X ={2,3,6,24,36,48- and relation ≤} be such that x≤y, if x divides y.	5	3	2	1,3,4
	OR				
3. c)	Prove that a relation R on A is symmetric if and only if $R = R^{-1}$	5	2	2	1,2,3
3. d)	A function f is defined as $f(x)=2x-3$ on a set R of real numbers. Check whether the function f is bijective or not, if so, find inverse of the function. And hence compute $f^{-1}of$.	5	2	2	1,3,4
	Unit-III				
4. a)	Use mathematical induction to prove that **1 + 2 + 3 + ... + n = n (n + 1) / 2** for all positive integers n.	5	3	3	1,2,3
4. b)	Prove that $\mathbf{1^2 + 2^2 + 3^2 + ... + n^2 = n (n + 1) (2n + 1)/ 6}$ using mathematical induction for all positive integers n.	5	3	3	1,3,4
	OR				
4. c)	State Pigeon hole principle. Make use of it, find how many people were born on the same month among 200 people.	5	2	3	1,2,3
4. d)	How many bit strings of length 8 contain i. exactly five 1's ii. an equal number of 0's and 1's iii. at least four 1's iv. at least three 1's and at least three 0's	5	3	3	1,3,4

Unit-IV					
5. a)	How many ways can we distribute 14 indistinguishable balls in 4 numbered boxes so that each box is non empty.	5	2	4	1,2,3
5. b)	A group of 8 scientists is composed of5-psychologists and 3-sociologists, in how many ways can a committee of 5 be formed that has 3- psychologists and 2-sociologists.	5	2	4	1,3,4
OR					
5. c)	Solve the recurrence relation $a_{n+2} + 3a_{n+1} + 2a_n = 3^n \; for \; n \geq 0, \; a_0 = 0, a_1 = 1$	5	2	4	1,2,3
5. d)	Solve the recurrence relation $an - an{-}1 - 12an{-}2 = 0$, $a0=0$, $a1 = 1$.	5	2	4	1,3,4
Unit-V					
6. a)	Define chromatic number of the graph. Write the chromatic number of complete graph, cycle graph, wheel graph, bipartite graph and regular graph.	5	1	5	1,2,3,4
6. b)	Differentiate Hamiltonian and Eulerian graphs.	5	2	5	1,3,4
OR					
6. c)	Make use of BFS algorithm to find a spanning tree of the following graph. Also explain BFS algorithm. 	5	3	5	1,2,3
6. d)	State and prove fundamental theorem of graph theory.	5	1	5	1,3,4

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